

CLAIMS

We claim:

1. A tubular structure, comprising:
 - an outer surface;
 - an inner surface; and
 - at least one raised rib, integrated with said inner surface or said outer surface, said rib formed by at least one of a layer of prepreg and a strand of a fiber.
2. A tubular structure according to claim 1, wherein the tubular structure is cylindrical.
3. A tubular structure according to claim 1, wherein a cross-section of the tubular structure is at least one of ovoid, triangular, rectangular and hexagonal.
4. A tubular structure according to claim 1, wherein the longitudinal axis of the tubular structure is a straight line.
5. A tubular structure according to claim 1, wherein the longitudinal axis of the tubular structure has at least one bent angle.
6. A tubular structure according to claim 1, wherein said raised rib is oriented from between about 0 and 90 degrees, relative to a longitudinal axis of the tubular structure.
7. A tubular structure according to claim 1, wherein said outer surface, said inner surface and said raised rib are composed of the same material.
8. A tubular structure according to claim 1, wherein said raised rib comprises a rib material different than the material of said outer surface or said inner surface.

9. A tubular structure according to claim 8, wherein said rib material is at least one of fiberglass, resin, copper, aluminum, steel, titanium, plastic and ceramic.

10. A tubular structure according to claim 8, wherein said rib material is attached to said outer surface or said inner surface by a composite veil layer of material that is the same as the material from which the rest of the tubular structure is made.

11. A tubular structure according to claim 1, wherein said raised rib defines a hollow cavity.

12. A tubular structure according to claim 11, wherein said hollow cavity encloses a sensing actuator.

13. A method for manufacturing a tubular structure, comprising:
manufacturing an expandable, elastomeric tube with at least one indented groove on its outer surface;
wrapping said elastomeric tube with at least one strand of a fiber, such that said at least one strand lies within said at least one indented groove,
wrapping said elastomeric tube and said at least one strand with layers of composite prepreg;
placing said elastomeric tube, said at least one strand and said layers of composite prepreg together into a mold for fabricating the tubular structure;
pressurizing said elastomeric tube;
inflating said elastomeric tube;
heating said elastomeric tube, said at least one strand and said layers of composite prepreg;
cooling said elastomeric tube, said at least one strand and said layers of composite prepreg; and
removing said elastomeric tube, said at least one strand and said layers of composite prepreg from said mold.



14. The method according to claim 13, wherein said elastomeric tube is composed of a rubber-like material.

15. The method according to claim 13, wherein said elastomeric tube is composed of a thermoplastic polymer.

16. The method according to claim 13, further comprising placing a mandrel inside said elastomeric tube, said at least one strand and said layers of prepreg and rolling said mandrel, said elastomeric tube, said at least one strand and said layers of prepreg on a horizontal surface to begin consolidation of said layers of prepreg.

17. The method according to claim 16, further comprising removing said mandrel before placing said elastomeric tube, said at least one strand and said layers of prepreg together into said mold.

18. The method according to claim 13, further comprising removing said elastomeric tube from said at least one strand and said layers of prepreg after removing said elastomeric tube, said at least one strand and said layers of prepreg from said mold.

19. The method according to claim 13, further comprising removing said at least one strand from said layers of prepreg after removing said elastomeric tube, said at least one strand and said layers of prepreg from said mold.

20. A method for manufacturing a tubular structure, comprising:
manufacturing an expandable, elastomeric tube with at least one indented groove on its outer surface;
wrapping said elastomeric tube with at least one strand of a fiber, such that said at least one strand lies within said at least one indented groove,
wrapping said elastomeric tube and said at least one strand with layers of composite prepreg;

8 placing a mandrel inside said elastomeric tube, said at least one strand and said
9 layers of prepreg;
10 rolling the mandrel, said elastomeric tube, said at least one strand and said layers of
11 prepreg on a horizontal surface to begin consolidation of said layers of prepreg;
12 removing said mandrel from inside said elastomeric tube, said at least one strand
13 and said layers of prepreg;
14 placing said elastomeric tube, said at least one strand and said layers of composite
15 prepreg together in a mold for fabricating the tubular structure;
16 pressurizing said elastomeric tube;
17 inflating said elastomeric tube;
18 heating said elastomeric tube, said at least one strand and said layers of composite
19 prepreg;
20 cooling said elastomeric tube, said at least one strand and said layers of composite
21 prepreg; and
22 removing said elastomeric tube, said at least one strand and said layers of
23 composite prepreg from the mold.

21. The method according to claim 20, wherein said elastomeric tube is composed of a rubber-like material.

22. The method according to claim 20, wherein said elastomeric tube is composed of a thermoplastic polymer.

1 23. A method for manufacturing a tubular structure, comprising:
2 manufacturing an expandable, elastomeric tube with a smooth surface;
3 wrapping said elastomeric tube with at least one strand of a fiber, such that said at
4 least one strand lies within said at least one indented groove,
5 wrapping said elastomeric tube and said at least one strand with layers of
6 composite prepreg;
7 placing said elastomeric tube, said at least one strand and said layers of composite

8 prepreg together in a mold for fabricating the tubular structure, said mold having at least one
9 indented groove on its inner surface;
10 pressurizing said elastomeric tube;
11 inflating said elastomeric tube;
12 heating said elastomeric tube, said at least one strand and said layers of composite
13 prepreg;
14 cooling said elastomeric tube, said at least one strand and said layers of composite
15 prepreg; and
16 removing said elastomeric tube, said at least one strand and said layers of
17 composite prepreg from said mold.

24. A method for manufacturing a tubular structure, comprising:
manufacturing an expandable, elastomeric tube with a smooth surface;
wrapping said elastomeric tube with at least one strand of a fiber, such that said at
least one strand lies within said at least one indented groove,
wrapping said elastomeric tube and said at least one strand with layers of
composite prepreg;
placing a mandrel inside said elastomeric tube, said at least one strand and said
layers of prepreg;
rolling the mandrel, said elastomeric tube, said at least one strand and said layers of
prepreg on a horizontal surface to begin consolidation of said layers of prepreg;
removing said mandrel from inside said elastomeric tube, said at least one strand
and said layers of prepreg;
placing said elastomeric tube, said at least one strand and said layers of composite
prepreg together in a mold for fabricating said tubular structure, said mold having at least one
indented groove on its inner surface;
pressurizing said elastomeric tube;
inflating said elastomeric tube;
heating said elastomeric tube, said at least one strand and said layers of composite
prepreg;

20 cooling said elastomeric tube, said at least one strand and said layers of composite
21 prepreg; and
22 removing said elastomeric tube, said at least one strand and said layers of
23 composite prepreg from said mold.

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